

## UNITED STATES AIR FORCE IERA

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# C-141 Confined Space Technical Guidance Document

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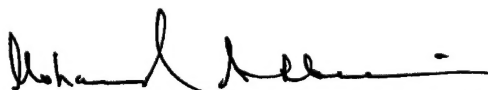
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13. ABSTRACT (Maximum 200 words) The following information and instructions apply to permit-required and nonpermit-required confined spaces associated with the C-141 aircraft. The majority of activities conducted within these spaces are for inspections and routine scheduled maintenance only. Flightline, depot, and other related activities are not referenced in this document. The information presented for each space type is based on the dimensions, inner characteristics, and interviews with shop personnel. Personnel performing aircraft maintenance and support are extensively trained in safe work practices, and work is conducted in accordance with (IAW) strict Technical Order (TO) and Operating Instruction (OI) directives. The TOs and OIs govern procedures such as lockout/tagout and system checks prior to entering the various areas of an aircraft.				
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# C-141 STARLIFTER



Figure 1. C-141 Starlifter

## INTRODUCTION

The Confined Space Technical Guidance Document is not a standardized compliance document. For specific compliance procedures, refer to AFOSH Standard 91-25, *Confined Spaces*; OSHA Standard 29 CFR 1910.146, *Permit-Required Confined Spaces*; and all other applicable AFOSH Standards, Technical Orders (TOs), and Operating Instructions (OIs). The following information and instructions apply to permit-required and nonpermit-required confined spaces associated with the C-141 aircraft.

The majority of activities conducted within these spaces are for inspections and routine scheduled maintenance only. Flightline, depot, and other related activities are not referenced in this document. The information presented for each space type is based on the dimensions, inner characteristics, and interviews with shop personnel. Personnel performing aircraft maintenance and support are extensively trained in safe work practices, and work is conducted in accordance with (IAW) strict TO and OI directives. The TOs and OIs govern procedures such as lockout/tagout and system checks prior to entering the various areas of an aircraft. The following table, *C-141 Space Classification*, lists the classification of each space assessed on the C-141.

**TABLE 1. Space Classification**

<b>C-141 Space Classification</b>		
<b>Space Type</b>	<b>Classification</b>	<b>Page Number</b>
Integral Fuel Tanks [Left/Right]:		4
• Main – #1/#4	CP	8
• Main – #2/#3		10
• Auxiliary - #1/#4		11
• Auxiliary – #2/#3		12
• Extended Range – Inboard/Outboard		13
Center Wing Dry Bay	CS	15
Underbelly (Floor) Area	CS	18
Vertical Stabilizer:		
• Vertical/Top Section	CS	20
• Horizontal/Bottom Section		
Hayloft	CS	23
Wheel Well Areas:		
• Aft (Left/Right)	NC	25
• Forward – Nose	NC	27
Wheel Well Pods:		
• Right (contains fuel lines)	NC	30
• Left		
Avionics Bay (under flight-deck)	NC	32
<b>NOTE: CS = Confined Space, CP = Permit-Required Confined Space, NC = Not a Confined Space.</b>		

**CLASSIFICATION CRITERIA**

A space is classified as a “confined space” when it meets the criteria established by AFOSH Standard 91-25, *Confined Spaces*, and OSHA Standard 29 CFR 1910.146, *Permit-Required Confined Spaces*. ALL of the following criteria must be met in order to classified a space as a confined space:

- the space is large enough to bodily enter and perform work, and
- the space has a limited means of entry and egress, and
- the space is not designed for continuous employee occupancy.

For each confined space, only one of the following criteria must be met in order to classify a confined space as permit-required:

- contains or has the potential to contain a hazardous atmosphere, or
- contains a material that has the potential for engulfing the entrant, or
- has an internal configuration such that an entrant could be trapped or asphyxiated, or

- contains any other recognized serious safety or health hazards.

## RECOMMENDED ATMOSPHERIC MONITORING

It is considered a good working practice to test the atmosphere in all confined spaces, both "permit required" and "non-permit required", prior to entry. The person designated to conduct atmospheric tests of confined spaces must be trained in operation, calibration, and maintenance of the testing equipment to include field calibration prior to each use. This may involve zero calibrating the instrument in clean air and using span gases for point calibrations. The atmospheric testing equipment must have a current calibration performed by the Test Measurement Diagnostic Equipment (TDME) lab or the manufacturer. The following atmospheric air monitoring must be conducted prior to permit-required confined space entries:

- **Oxygen (O<sub>2</sub>):** The concentration of oxygen in the confined space must be greater than or equal to 19.5 percent and less than or equal to 23.5 percent.
- **Flammability:** The concentration of flammable or combustible vapors, gas, or mist in the confined space must be less than or equal to 10 percent of the Lower Explosive Limit (LEL).
- **Toxic Materials:** Atmospheric concentration of any chemical substance must be below that level which may cause death, incapacitation, impairment of ability to self-rescue, injury, or acute illness due to its health effects.

During normal operations, entries must not be conducted when immediately dangerous to life and health (IDLH) conditions exist. Exceptions to this rule are found in AFOSH Standard 91-25, *Confined Spaces*, paragraph 4.3.

# C-141 STARLIFTER

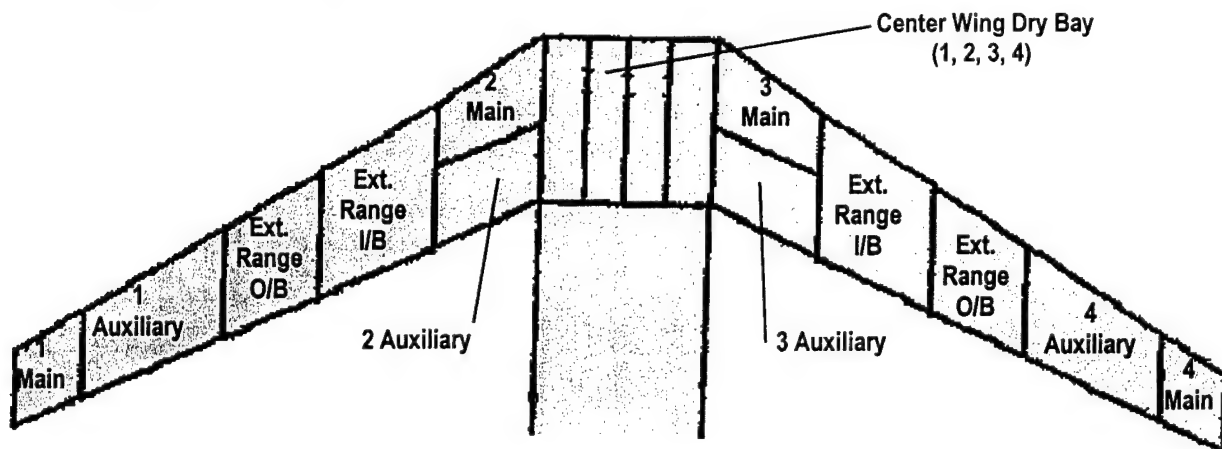
## INTEGRAL FUEL TANKS – GENERAL CONDITIONS AND REQUIRED PROCEDURES

### SPACE DESCRIPTION

The C-141 aircraft contains a total of 12 (6 on each wing) integral fuel tanks. Integral fuel tanks were developed because they offer the capacity of greater fuel containment with a decrease in weight over a fuel cell type construction. They are designed with seal planes instead of fuel bladders (like the fuel cells) for retaining the fuel. Seal planes provide airtight dividers between the dry bays and surrounding sides of the fuel tanks. They are sealed with gaskets, structural adhesives, elastic films or other sealants. Integral fuel tanks are divided into three types (main, auxiliary, and extended range). The main integral fuel tanks feed fuel to the engines; and the auxiliary and extended range integral fuel tanks store and transfer fuel to the main tanks. The fuel tanks contain fuel lines, boost pumps, transfer pumps, check valves, refuel valves, isolation valves, dump valves, fuel level control valves, fuel check valves, and fuel drain pumps.

Confined space entries into the integral fuel tanks and fuel cells are performed IAW TO 1-1-3, *Inspection and Repair of Aircraft Integral Tanks and Fuel Cells*, 30 November 1994. The TO includes the following information regarding fuel tanks and fuel cells:

- Entering fuel tanks that have been depuddled, purged, docked, and grounded.
- Identifies specific repair/rework procedures, equipment, and chemicals which are authorized for use during entries into integral fuel tanks.
- Outlines specific safety procedures such as ventilation, personal protective equipment, emergency equipment, etc.



## TASKS PERFORMED WITHIN THE SPACE

Personnel from several work centers can enter the fuel tanks to perform both general and emergency maintenance activities. These work centers may include Aircraft Structural Repair, Non-Destructive Inspection Maintenance, Isochronal (ISO) Dock, etc. The majority of activities conducted within this space are for inspections and routine scheduled maintenance only, and no chemicals are used. Flightline, depot, and other related activities are not referenced in this document. However, some of the tasks performed during aircraft structural repair and ISO Dock maintenance, may require the use of various solvents, cleaners, adhesives, paints, and primers. The following lists scheduled routine maintenance conducted predominantly by the Fuel Systems shop:

- Three integral fuel tanks per week are sealed on each aircraft. The process takes 2 to 6 hours. First, the fuel tank is entered to visually locate leaks from the panel edges. The defective sealant is removed before the new sealant is installed. Each seam leak requires 1 to 3 ounces of Methyl Ethyl Ketone (MEK), 1 to 3 ounces of Primer-148, 2 to 6 ounces of Polysulfide sealant, and 12 ounces of Mold Release. This procedure is performed IAW TOs 1-1-3 and 1C-141B-2-00GE-00-1.
- Fuel tank leak isolations are conducted three times per week on each aircraft. The process takes 1 to 2 hours. Each leak isolation requires 1 to 3 ounces of MEK and two quarts of a leak detection compound. This procedure is performed IAW TO 1-1-3.
- Two to four fuel tank components are replaced per month on each aircraft. The process takes 2 to 8 hours. The components include boost pumps, transfer pumps, fuel manifolds, refuel valves, isolation valves, and dump valves. Each component replacement requires 1 to 3 ounces of MEK, 1 to 2 ounces of Petrolatum, and 1 to 2 ounces of Polysulfide sealant. This procedure is performed IAW TOs 1-1-3 and 1C-141B-2-28JG-00-1, *Fuel Systems General*.

Only authorized materials, or materials that have been fully evaluated and approved by Installation Ground Safety (SEG), Installation Fire Department (CEF), and Bioenvironmental Engineering (BE) offices can be used within the integral fuel tanks. Hot work, such as grinding, welding or brazing in a permit-required confined space requires a confined space entry permit AND a hot work permit. Both permits must be reviewed and approved in writing by SEG, CEF, and BE prior to conducting any hot work in the space.

## POTENTIAL HAZARDS

The following table, *Potential Hazards*, contains various hazards that could be encountered when performing permit-required confined space entries into the fuel tanks. The systems described in the table (e.g., fuel lines/valves, fuel drain pumps) are closed/contained, and are hazardous if they are intentionally opened or a significant leak occurs. These conditions are unlikely due to personnel training and specific aircraft TOs and OIs that are strictly complied with. The TOs and OIs govern procedures such as lockout/tagout and system checks prior to entering the various areas of the aircraft.

**TABLE 2. Potential Hazards (Integral Fuel Tanks- General)**

<b>POTENTIAL HAZARDS</b>	
<b>Hazard</b>	<b>Hazard Description</b>
<b>Combustibility</b>	The fuel tanks have the potential to contain jet fuel and/or jet fuel vapors that are combustible.
<b>Entrapment</b>	The integral fuel tanks are extremely confined areas that contain several structural braces/ribs and fuel piping/pumps/valves throughout the space. This creates an entrapment hazard for entry personnel due to limited maneuverability and egress.
<b>Hazardous Materials Present</b>	Jet fuel and/or fuel vapors may be present in various cavities of the space. Jet fuel and its constituents (e.g., benzene, toluene, xylene) can be a potential hazard to the entrant by route of inhalation, skin absorption, ingestion, and contact.
<b>Introduction of Hazardous Materials</b>	The solvents and cleaners used for cleaning, and adhesives used for sealing the tanks, could potentially include hazardous materials. Only authorized chemicals should be used within the space.
<b>Oxygen Deficiency</b>	Oxygen deficiency caused by oxygen displacement is a potential hazard due to unfavorable ventilation and fuel vapors. In addition, several operations require the use of solvents, cleaners, and/or adhesives. Depending on the quantity and duration of use, the constituents of the chemicals could displace the oxygen within the space.
<b>Temperature Extremes</b>	Temperature extremes may present a hazard due to one or a combination of several factors such as ambient temperature, radiant heat, local winds, support equipment, and PPE.
<b>Unfavorable Natural Ventilation</b>	Due to the small entry access into the integral fuel tanks, there is normally minimal natural ventilation.

## RECOMMENDED ENGINEERING/ADMINISTRATIVE CONTROLS

The following engineering and administrative controls should be in place prior to making permit-required confined space entries into fuel tanks and fuel cells:

- **Depuddling:** Fuel tanks will be defueled, drained, depuddled, and purged to the extent necessary to perform the required tasks.

- **Electrical:** Except for specific depot exclusions, the aircraft electrical system shall be deenergized and locked and tagged out prior to opening integral fuel tanks. The aircraft should also be grounded and bonded prior to entry.
- **Lockout/Tagout:** Lockout/tagout procedures must be performed on electrical and mechanical systems prior to entry. Danger tags are placed on the relevant circuit breakers, batteries, and external power. Restricted areas are established to minimize foot traffic.
- **Ventilation:** Fuel tanks shall be ventilated for 30 minutes prior to space occupancy and continuously during entry. Ventilation must be used as necessary to ensure safe atmospheric conditions during entry.
- **Administrative:** Personnel should minimize the time spent in confined spaces by performing only necessary tasks within the space. Any work that can be conducted outside of the space should not be performed during the entry.

## **RECOMMENDED PERSONAL PROTECTIVE EQUIPMENT (PPE)**

PPE must be assigned based on the atmospheric conditions of the confined space, the physical hazards present, the task being performed, and the hazardous materials being used. Protective equipment that may be used for tasks in this space include:

- respiratory protection,
- non-absorbent coveralls,
- approved footwear,
- disposable nitrile or neoprene gloves for sealant operations,
- cap or head covering,
- goggles or safety glasses with side shields, and
- neoprene rubber knee pads, elbow pads, or mats.

## **RECOMMENDED EMERGENCY EQUIPMENT**

The following emergency equipment is recommended to be present in the Fuels or Flightline Maintenance area and verified to be in working condition by the designated entry authority prior to authorizing entries:

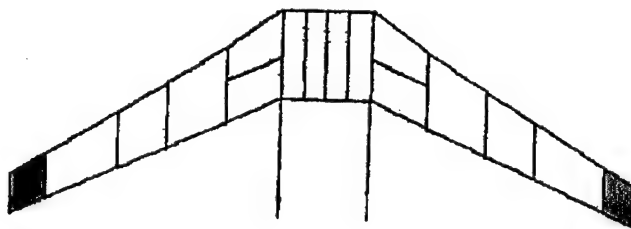
- intrinsically safe hand radio,
- 150 pound halon fire extinguisher,
- intrinsically safe flashlights, lamps, or lanterns rated for class I, division 1 hazardous atmospheres,

- additional respiratory protection as recommended by BE, and
- rescue webbing harness.



# C-141 STARLIFTER

## INTEGRAL FUEL TANKS – MAIN (1, 4)



### SPACE DESCRIPTION

There is a single main integral fuel tank (1, 4) on each wing of the C-141 aircraft (two tanks total) that can be bodily entered from the waist up by maintenance personnel. These tanks feed fuel to the engines. They are located at the wing tips next to the auxiliary integral fuel tanks (1, 4). Each tank contains fuel lines, boost pumps, transfer pumps, check valves, refuel valves, isolation valves, dump valves, fuel level control valves, fuel check valves, and fuel drain pumps.

### INNER DIMENSIONS

1,265 gallon capacity  
Depth = 1.0'

### ENTRY DIMENSIONS

1. Length = 6.0' Width = 1.5'
  2. Length = 6.0' Width = 1.5'
- (rectangular entrances)

[The depth is the distance from the entrance to the most distant point.]

### SPACE ACCESS/INNER AREA

Each main fuel tank has two rectangular access panels located on the bottom of the wing.

### RECOMMENDED CLASSIFICATION

Permit-required confined space.

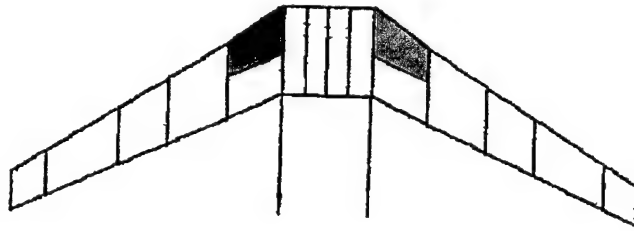
## **JUSTIFICATION FOR CLASSIFICATION**

The main fuel tanks are permit-required due to the following conditions:

- contains or has the potential to contain a hazardous atmosphere (e.g., fuel and its constituents), and
- has an internal configuration such that an entrant could be trapped or asphyxiated (e.g., limited space congested with fuel lines/pumps/valves and support braces/ribs).

# C-141 STARLIFTER

## INTEGRAL FUEL TANKS – MAIN (2, 3)



### SPACE DESCRIPTION

There is a single main integral fuel tank (2, 3) on each wing of the C-141 aircraft (two tanks total) that can be bodily entered from waist up by maintenance personnel. These tanks feed fuel to the engines. They are located forward to the auxiliary fuel tanks (2, 3). Each tank contains fuel lines, boost pumps, transfer pumps, check valves, refuel valves, isolation valves, dump valves, fuel level control valves, fuel check valves, and fuel drain pumps.

### INNER DIMENSIONS

2,178 gallon capacity  
Depth = 4.0'

### ENTRY DIMENSIONS

Length = 19.0"    Width = 10.0"  
(oval entrance)

[The depth is the distance from the entrance to the most distant point.]

### SPACE ACCESS/INNER AREA

Each main fuel tank has a single oval access located on the top of the wing.

### RECOMMENDED CLASSIFICATION

Permit-required confined space.

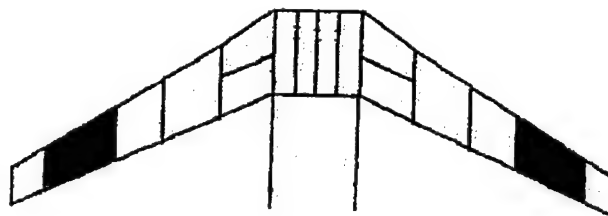
### JUSTIFICATION FOR CLASSIFICATION

The main fuel tanks are permit-required due to the following conditions:

- contains or has the potential to contain a hazardous atmosphere (e.g., fuel and its constituents), and
- has an internal configuration such that an entrant could be trapped or asphyxiated (e.g., limited space congested with fuel lines/pumps/valves and support braces/ribs).

# C-141 STARLIFTER

## INTEGRAL FUEL TANKS – AUXILIARY (1, 4)



### SPACE DESCRIPTION

There is a single auxiliary integral fuel tank (1, 4) on each wing of the C-141 aircraft (two tanks total) that can be entered completely by maintenance personnel. The auxiliary fuel tanks store and transfer fuel to the main integral fuel tanks. These tanks are located between the main integral fuel tanks (1, 4) and the outboard extended range tanks. Each tank contains fuel lines, boost pumps, transfer pumps, check valves, refuel valves, isolation valves, dump valves, fuel level control valves, fuel check valves, and fuel drain pumps.

### INNER DIMENSIONS

2,572 gallon capacity  
Depth = 2.0'

### ENTRY DIMENSIONS

Length = 19.0"    Width = 10.0"  
(oval entrance)

[The depth is the distance from the entrance to the most distant point.]

### SPACE ACCESS/INNER AREA

Each auxiliary fuel tank has a single oval access located on top of the wing.

### RECOMMENDED CLASSIFICATION

Permit-required confined space.

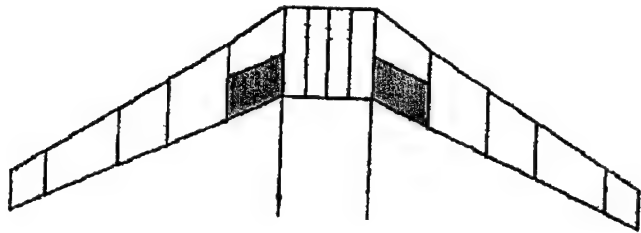
### JUSTIFICATION FOR CLASSIFICATION

The auxiliary fuel tanks are permit-required due to the following conditions:

- contains or has the potential to contain a hazardous atmosphere (e.g., fuel and its constituents), and
- has an internal configuration such that an entrant could be trapped or asphyxiated (e.g., limited space congested with fuel lines/pumps/valves and support braces/ribs).

# C-141 STARLIFTER

## INTEGRAL FUEL TANKS – AUXILIARY (2, 3)



### SPACE DESCRIPTION

There is a single auxiliary integral fuel tank (2, 3) on each wing of the C-141 aircraft (two tanks total) that can be entered completely by maintenance personnel. The auxiliary fuel tanks store and transfer fuel to the main integral fuel tanks. These tanks are located aft of the main integral fuel tanks (2, 3). Each tank contains fuel lines, boost pumps, transfer pumps, check valves, refuel valves, isolation valves, dump valves, fuel level control valves, fuel check valves, and fuel drain pumps.

### INNER DIMENSIONS

1,701 gallon capacity  
Depth = 2.0'

### ENTRY DIMENSIONS

Length = 19.0"    Width = 10.0"  
(oval entrance)

[The depth is the distance from the entrance to the most distant point.]

### SPACE ACCESS/INNER AREA

Each auxiliary fuel has a single oval access located on the top of the wing.

### RECOMMENDED CLASSIFICATION

Permit-required confined space.

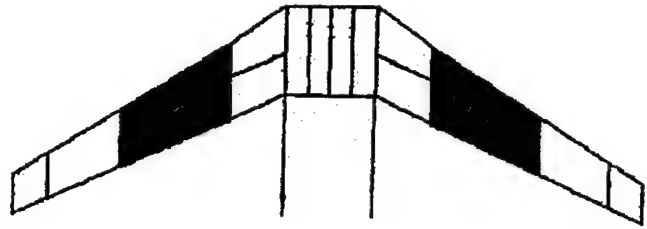
### JUSTIFICATION FOR CLASSIFICATION

The auxiliary fuel tanks are permit-required due to the following conditions:

- contains or has the potential to contain a hazardous atmosphere (e.g., fuel and its constituents), and
- has an internal configuration such that an entrant could be trapped or asphyxiated (e.g., limited space congested with fuel lines/pumps/valves and support braces/ribs).

# **C-141 STARLIFTER**

## **INTEGRAL FUEL TANKS – EXTENDED RANGE (INBOARD/OUTBOARD)**



### **SPACE DESCRIPTION**

There two extended range integral fuel tank on each wing of the C-141 aircraft (four tanks total) that can be entered completely by maintenance personnel. The extended range fuel tanks store and transfer fuel to the main integral fuel tanks. These tanks are located between the auxiliary fuel tanks (1, 4) and the #2 fuel tanks (#2 main and #2 auxiliary). Each tank contains fuel lines, boost pumps, transfer pumps, check valves, refuel valves, isolation valves, dump valves, fuel level control valves, fuel check valves, and fuel drain pumps.

### **INNER DIMENSIONS**

4,140 gallon capacity (combined)  
Depth = 2.5' to 3.0'

### **ENTRY DIMENSIONS**

Length = 19.0"    Width = 10.0"  
(oval entrance)

[The depth is the distance from the entrance to the most distant point.]

### **SPACE ACCESS/INNER AREA**

Each extended range fuel tank has a single oval access located on the top of the wing. Each wing has two extended range fuel tank accesses. The combined capacity of the inboard and outboard extended range tanks is 4,140 gallons.

### **RECOMMENDED CLASSIFICATION**

Permit-required confined space.

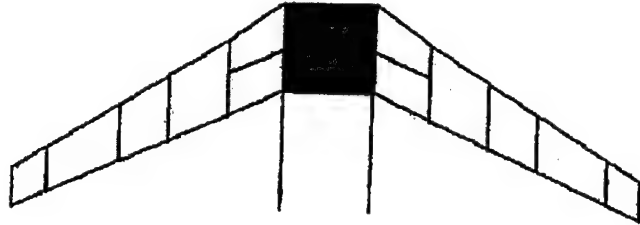
## **JUSTIFICATION FOR CLASSIFICATION**

The extended range fuel tanks are permit-required due to the following conditions:

- contains or has the potential to contain a hazardous atmosphere (e.g., fuel and its constituents), and
- has an internal configuration such that an entrant could be trapped or asphyxiated (e.g., limited space congested with fuel lines/pumps/valves and support braces/ribs).

# C-141 STARLIFTER

## CENTER WING DRY BAY



### SPACE DESCRIPTION

The center wing dry bay is located between the wings of the C-141, and is divided into four sections: #1, #2, #3, and #4. The center wing dry bay contains electrically operated fuel control valves, air refuel separation valves, ground refuel isolation valves, and various check valves.

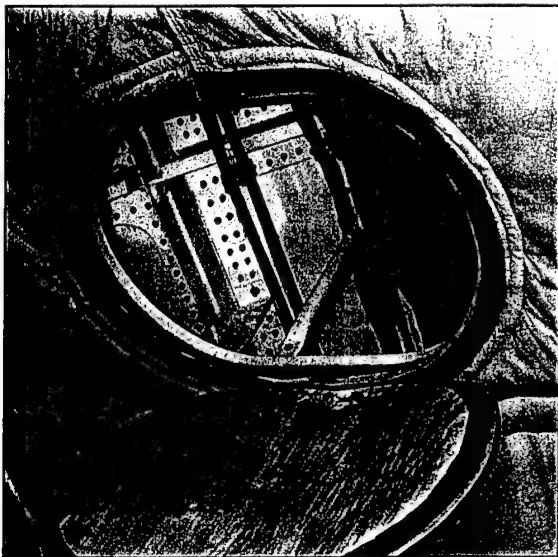


Figure 2. Center Wing Dry Bay: Bottom access.

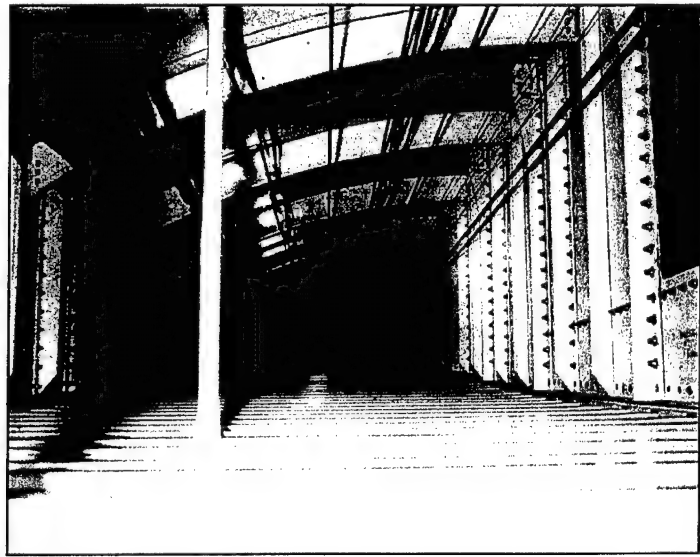


Figure 3. Center Wing Dry Bay: Interior of section #2.

### INNER DIMENSIONS

#### Entire Space:

Length (fwd to aft) = 15.0' to 20.0'  
Width (left to right) = 10.0' to 12.0'  
Height (top to bottom) = 2.5'

#### Section #1:

Length (fwd to aft) = 15.0' to 20.0'  
Width (left to right) = 2.5' to 3.0'  
Height (top to bottom) = 2.5'

### ENTRY DIMENSIONS

1. Bottom:	Length = 18.0"	Width = 14.0"
2. Side:	Length = 18.0"	Width = 14.0"
3. Side:	Length = 18.0"	Width = 14.0"
4. Side:	Length = 18.0"	Width = 14.0"

1. Side:	Length = 18.0"	Width = 14.0"
----------	----------------	---------------



#### Section #2:

Length (fwd to aft) = 15.0' to 20.0'

Width (left to right) = 2.5' to 3.0'

Height (top to bottom) = 2.5'

1. Bottom: Length = 18.0" Width = 14.0"

2. Side: Length = 18.0" Width = 14.0"

#### Section #3:

Length (fwd to aft) = 15.0' to 20.0'

Width (left to right) = 2.5' to 3.0'

Height (top to bottom) = 2.5'

1. Side: Length = 18.0" Width = 14.0"

#### Section #4:

Length (fwd to aft) = 15.0' to 20.0'

Width (left to right) = 2.5' to 3.0'

Height (top to bottom) = 2.5'

1. Side: Length = 18.0" Width = 14.0"

(all entrances are oval)

### **SPACE ACCESS/INNER AREA**

The center wing dry bay is divided into four sections. The sections are interconnected through three side entrances. The only bottom access is located on the bottom of section #2.

### **RECOMMENDED CLASSIFICATION**

Nonpermit-required confined space.

### **JUSTIFICATION FOR CLASSIFICATION**

The space contains a variety of closed/contained systems (e.g., electrically operated fuel control valves, air refuel separation valves, ground refuel isolation valves, and various check valves) that are not CREDIBLE potential hazards and therefore is not a permit-required confined space. The systems are hazardous if they are intentionally opened or a significant leak occurs. These conditions are unlikely due to personnel training and specific aircraft TOs and OIs that personnel are strictly required to comply with. The TOs and OIs govern procedures such as lockout/tagout and system checks prior to entering the various areas of the aircraft.

## TASKS PERFORMED WITHIN THE SPACE

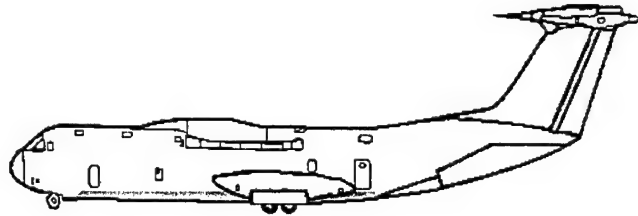
Personnel from several work centers can enter the center wing dry bay to perform both general and emergency maintenance activities. These work centers may include Aircraft Structural Repair, Non-Destructive Inspection Maintenance, ISO Dock, etc. The majority of activities conducted within this space are for inspections and routine scheduled maintenance only, and no chemicals are used. Flightline, depot, and other related activities are not referenced in this document. However, some tasks performed during aircraft structural repair and ISO Dock maintenance, may require the use of various solvents, cleaners, adhesives, paints, and primers. The following task may be performed during scheduled and routine maintenance:

- One or two valves (e.g., separation fuel control valves, air refuel separation valves, ground refuel isolation valves, various check valves) are replaced or repaired every month on each aircraft. Each valve takes 6 hours to repair or replace. Less than three ounces of Petrolatum is used for each valve. This task is performed under TO 1C-141B-2-28JG-20-1-2, *Fuel Systems Distribution*.

Only authorized materials, or materials that have been fully evaluated and approved by SEG, CEF, and BE offices can be used within the center wing dry bay.

# C-141 STARLIFTER

## UNDERBELLY (UNDER-FLOOR) AREA



### SPACE DESCRIPTION

The underbelly (under-floor) area is located along the underbelly of the aircraft, below the cargo floor. The underbelly area contains nose landing gear (NLG) hydraulic lines, floor heating ducts/valves, water lines, electrical heat valve wires, support braces/ribs, and electrical wiring for exterior lights.



Figure 4. Underbelly (Floor) Area: Two bottom entrances located near nose (forward).

### INNER DIMENSIONS

Length (fwd to aft) = 95.0'  
Width (left to right) = 12.0'  
Depth (top to bottom) = 2.5'

### ENTRY DIMENSIONS

1. Bottom: Length = 1.5' Width = 1.5'  
2. Bottom: Length = 1.5' Width = 1.5'  
(rectangular entrances)

[The depth is the distance from the entrance to the most distant point.]

## **SPACE ACCESS/INNER AREA**

The cross-section of the underbelly area is "U"-shaped, with the curved part of the "U" on the bottom of the space. The deepest part of the underbelly area is 2.5 feet. The two bottom entrances are located on the underbelly of the aircraft near the forward end.

## **RECOMMENDED CLASSIFICATION**

Nonpermit-required confined space.

## **JUSTIFICATION FOR CLASSIFICATION**

The space contains a variety of closed/contained systems (e.g., NLG hydraulic lines, floor heating ducts/valves, water lines, electrical heat valve wires, electrical wires for exterior lights) that are not CREDIBLE potential hazards and therefore is not a permit-required confined space. The systems are hazardous if they are intentionally opened or a significant leak occurs. These conditions are unlikely due to personnel training and specific aircraft TOs and OIs that personnel are strictly required to comply with. The TOs and OIs govern procedures such as lockout/tagout and system checks prior to entering the various areas of the aircraft.

## **TASKS PERFORMED WITHIN THE SPACE**

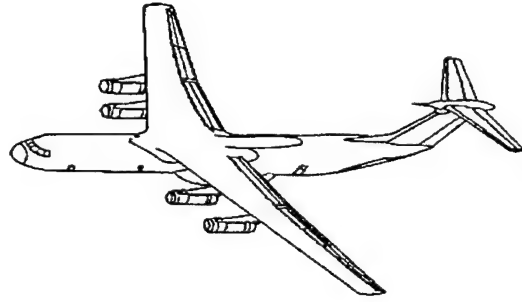
Personnel from several work centers can enter the underbelly area to perform both general and emergency maintenance activities. These work centers may include Aircraft Structural Repair, Non-Destructive Inspection Maintenance, ISO Dock, etc. The majority of activities conducted within this space are for inspections and routine scheduled maintenance only, and no chemicals are used. Flightline, depot, and other related activities are not referenced in this document. However, some tasks performed during aircraft structural repair and ISO Dock maintenance, may require the use of various solvents, cleaners, adhesives, paints, and primers. The following tasks may be performed during scheduled and routine maintenance:

- *1C-141B-2-29JG-10-1-1, Hydraulic Systems.*
- *1C-141B-2-29JG-10-1-1, Hydraulic Systems Operational Check.*

Only authorized materials, or materials that have been fully evaluated and approved by SEG, CEF, and BE offices can be used within the underbelly area.

# C-141 STARLIFTER

## VERTICAL STABILIZER



### SPACE DESCRIPTION

The vertical stabilizer controls the rudder (left/right) motion of the aircraft. It is located in the tail section (empennage) of the aircraft. The space is divided into two sections: the horizontal bottom section and the vertical top section. The vertical stabilizer contains hydraulic pitch trim actuator (PTA) lines, electrical PTA wires, flight control cables (elevator/rudder), electrical empennage actuators, and a jack-screw.

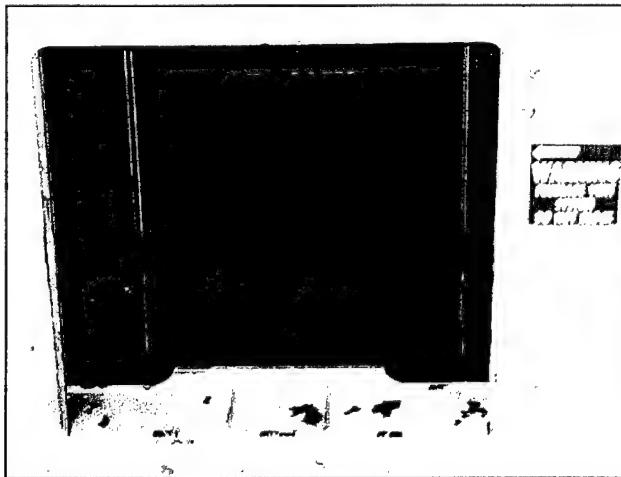


Figure 5. Vertical Stabilizer: Bottom access to horizontal bottom section.

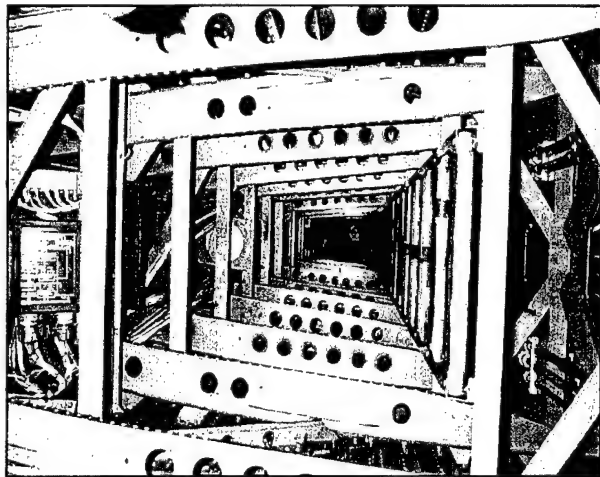


Figure 6. Vertical Stabilizer: Inside vertical top section.

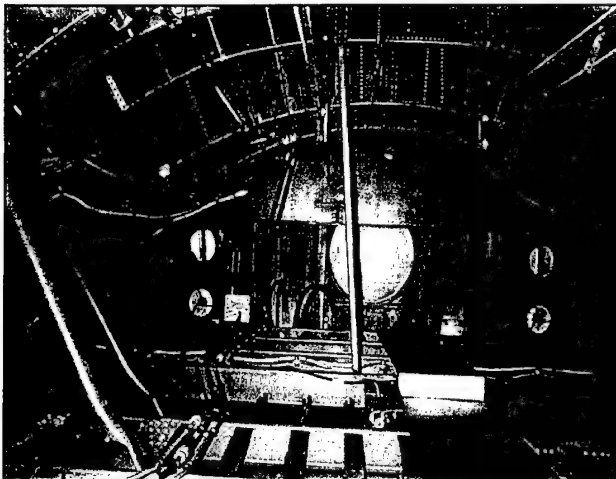


Figure 7. Vertical Stabilizer: Horizontal bottom section (forward end) facing side entrance to hayloft.

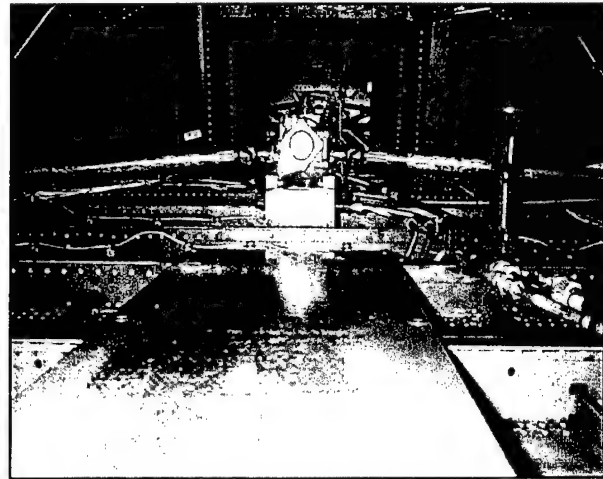


Figure 8. Vertical Stabilizer: Horizontal bottom section (aft end).

## INNER DIMENSIONS

### Horizontal Bottom Section:

Length (fwd to aft) = 30.0'  
Width (left to right) = 6.0'  
Height (top to bottom) = 4.0'

### Vertical Top Section:

Length (fwd to aft) = 5.0'  
Width (left to right) = 5.0'  
Height (top to bottom) = 2.5'

## ENTRY DIMENSIONS

1. Bottom: Length = 18.0"      Width = 14.0"
2. Side: Diameter = 22.0"

1. Bottom: Length = 22.0"      Width = 14.0"

## SPACE ACCESS/INNER AREA

The horizontal bottom access of the vertical stabilizer is accessed from the bottom of the space located along the exterior rear side of the aircraft (18.0" x 14.0" access). The forward area of the horizontal bottom section has a side circular entrance (22" diameter) to the hayloft. The vertical top section of the vertical stabilizer is entered from the top of the horizontal section (22.0" x 14" access). This area is similar to crawlspace oriented at a 75° angle.

## RECOMMENDED CLASSIFICATION

Nonpermit-required confined space.

## JUSTIFICATION FOR CLASSIFICATION

The space contains a variety of closed/contained systems (e.g., hydraulic PTA lines, electrical PTA wires, flight control cables [elevator/rudder], electrical empennage actuators, jack-screw) that are not CREDIBLE potential hazards and therefore is not a permit-required confined space. The systems are hazardous if they are intentionally opened or a significant leak occurs. These conditions are unlikely due to personnel training and specific aircraft TOs and OIs that personnel are strictly required to comply with. The TOs and OIs govern procedures such as lockout/tagout and system checks prior to entering the various areas of the aircraft.

## TASKS PERFORMED WITHIN THE SPACE

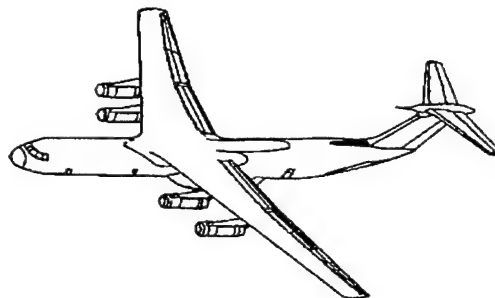
Personnel from several work centers can enter the vertical stabilizer to perform both general and emergency maintenance activities. These work centers may include Aircraft Structural Repair, Non-Destructive Inspection Maintenance, ISO Dock, etc. The majority of activities conducted within this space are for inspections and routine scheduled maintenance only, and no chemicals are used. Flightline, depot, and other related activities are not referenced in this document. However, some tasks performed during aircraft structural repair and ISO Dock maintenance, may require the use of various solvents, cleaners, adhesives, paints, and primers. The following tasks may be performed during scheduled and routine maintenance:

- Replacement of various cables (e.g., PTA, elevator, rudder). This task is performed under TO 1C-141B-2-27JG-00-1, *Flight Controls General*.
- Replacement of PTA, elevator control quadrant, rudder trim actuator, and pitch trim quadrants. This task is performed under TOs 1C-141B-2-27JG-00-1, *Flight Controls General* and 1C-141B-2-29JG-10-1-1, *Hydraulic Systems*.
- Inspect and troubleshoot high frequency radio wires and the radio control box.

Only authorized materials, or materials that have been fully evaluated and approved by SEG, CEF, and BE offices can be used within the vertical stabilizer.

# C-141 STARLIFTER

## HAYLOFT



### SPACE DESCRIPTION

The hayloft is located in the tail section (empennage) of the C-141, forward to the bottom section of the vertical stabilizer. The space is entered from the forward side of the vertical stabilizer horizontal bottom section. The hayloft contains hydraulic rudder/empennage lines, flight control cables (elevator/rudder), electrical empennage/rudder wires, data recorder box ("black box"), and two emergency depressurization valves ("dump valves").

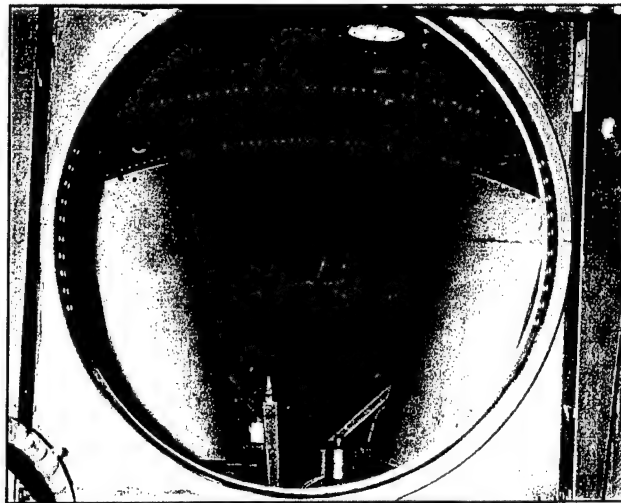
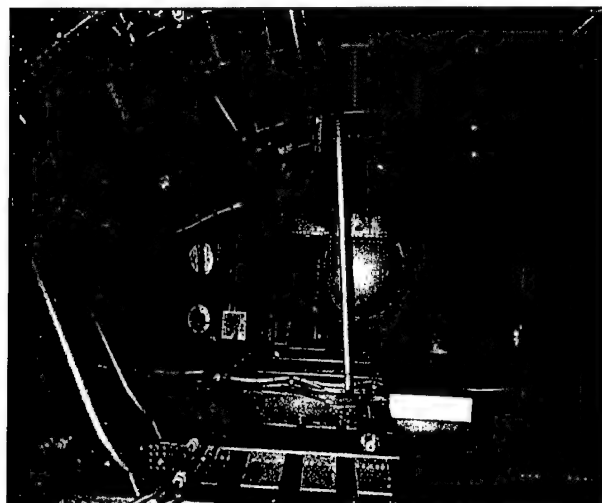


Figure 9. Hayloft: Side entrance from inside fwd end of vertical stabilizer. Figure 10. Hayloft: Side entrance & interior (facing forward).

### INNER DIMENSIONS

Height (top to bottom) = 4.5'  
Width (left to right) = 14.0'  
Depth (fwd to aft) = 9.0'

### ENTRY DIMENSIONS

Side: Diameter = 22.0"  
(circular entrance)

[The depth is the distance from the entrance to the most distant point.]

### SPACE ACCESS/INNER AREA

The hayloft is entered through a circular side entrance located in the bottom section of the vertical stabilizer.



## RECOMMENDED CLASSIFICATION

Nonpermit-required confined space.

## JUSTIFICATION FOR CLASSIFICATION

The space contains a variety of closed/contained systems (e.g., hydraulic rudder/empennage lines, flight control cables, electrical empennage/rudder wires, data recorder box, emergency depressurization valves) that are not CREDIBLE potential hazards and therefore is not a permit-required confined space. The systems are hazardous if they are intentionally opened or a significant leak occurs. These conditions are unlikely due to personnel training and specific aircraft TOs and OIs that personnel are strictly required to comply with. The TOs and OIs govern procedures such as lockout/tagout and system checks prior to entering the various areas of the aircraft.

## TASKS PERFORMED WITHIN THE SPACE

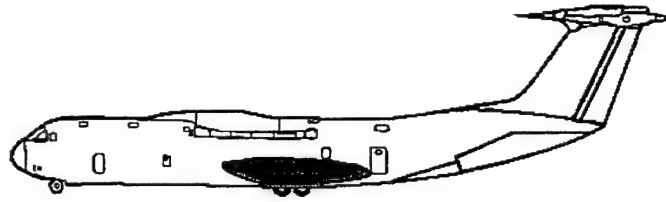
Personnel from several work centers can enter the hayloft to perform both general and emergency maintenance activities. These work centers may include Aircraft Structural Repair, Non-Destructive Inspection Maintenance, ISO Dock, etc. The majority of activities conducted within this space are for inspections and routine scheduled maintenance only, and no chemicals are used. Flightline, depot, and other related activities are not referenced in this document. However, some tasks performed during aircraft structural repair and ISO Dock maintenance, may require the use of various solvents, cleaners, adhesives, paints, and primers. The following tasks may be performed during scheduled and routine maintenance:

- Replacement of various cables (e.g., PTA, elevator, rudder). This task is performed under TO 1C-141B-2-27JG-00-1, *Flight Controls General*.
- Replacement of PTA, elevator control quadrant, rudder trim actuator, and pitch trim quadrants. This task is performed under TOs 1C-141B-2-27JG-00-1, *Flight Controls General* and 1C-141B-2-29JG-10-1-1, *Hydraulic Systems*.
- Inspect and troubleshoot high frequency radio cabling and control box.

Only authorized materials, or materials that have been fully evaluated and approved by SEG, CEF, and BE offices can be used within the hayloft.

# C-141 STARLIFTER

## WHEEL WELL AREA – AFT (LEFT/RIGHT)



### SPACE DESCRIPTION

There is an aft wheel well area located on each side of the C-141 aircraft. The uplock assembly section is located above the wheel well area. Both components are collectively classified as the wheel well area. The space contains the landing gear, the wheel and tire assembly, the hydraulic brake system, electrical lines, hydraulic/nitrogen struts, and gear assembly.

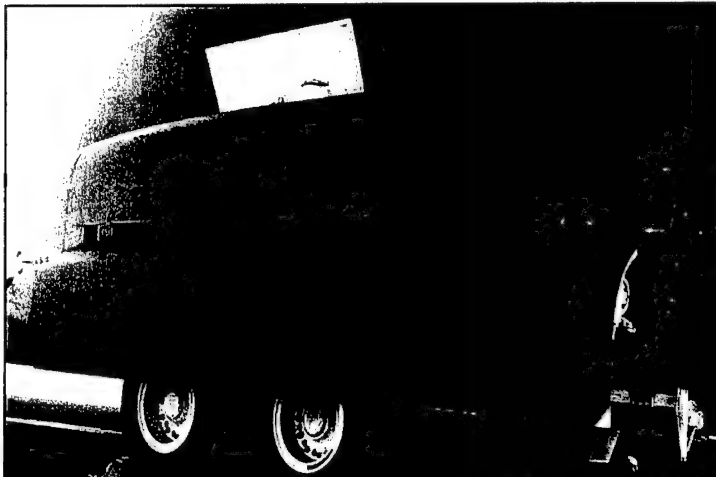


Figure 11. Aft Wheel Well Area: Exterior (right outboard side).

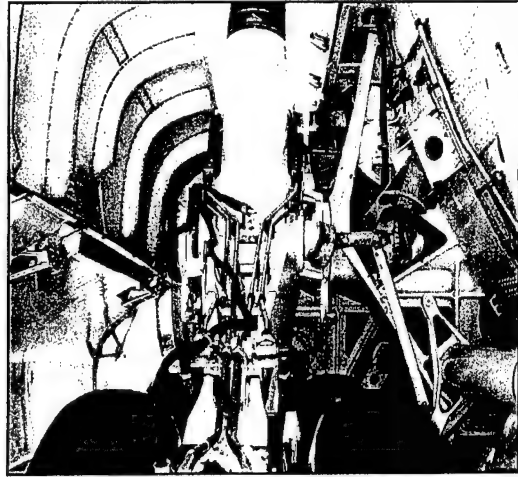


Figure 12. Aft Wheel Well Area: Interior.

### INNER DIMENSIONS

Length (forward to aft) = 7.0'  
Width (left to right) = 7.0'  
Depth (top to bottom) = 9.0'

### ENTRY DIMENSIONS

1. Length = 14.0'      Width = 3.0'  
2. Length = 14.0'      Width = 3.0'  
(both entrances are rectangular)

[The depth is the distance from the entrance to the most distant point.]

### SPACE ACCESS/INNER AREA

Each wheel well area has two entrances that are located at the bottom of the space. The outer entrance panel is located along the outer curved portion of the aft wall.

## RECOMMENDED CLASSIFICATION

Not a confined space.

## JUSTIFICATION FOR CLASSIFICATION

The wheel well area does not have a limited means of entry and egress due to the size of the bottom entrances. Therefore, it is not a confined space and not regulated IAW the AFOSH and OSHA confined space standards.

## TASKS PERFORMED WITHIN THE SPACE

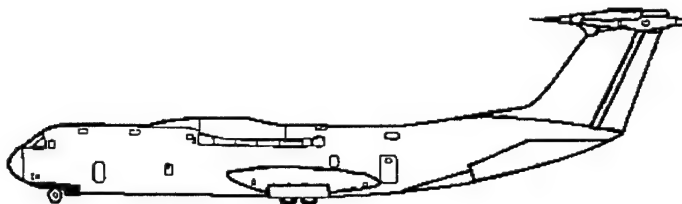
Personnel from several work centers can enter the wheel well area to perform both general and emergency maintenance activities. These work centers may include Aircraft Structural Repair, Non-Destructive Inspection Maintenance, ISO Dock, etc. The majority of activities conducted within this space are for inspections and routine scheduled maintenance only, and no chemicals are used. Flightline, depot, and other related activities are not referenced in this document. However, some tasks performed during aircraft structural repair and ISO Dock maintenance, may require the use of various solvents, cleaners, adhesives, paints, and primers. The following tasks may be performed during scheduled and routine maintenance:

- Scheduled maintenance inspections are conducted on each wheel and tire assembly as needed or depending on the number of landings. The bearings are greased/lubed, and nitrogen is added to the tires. Both tasks take a few minutes. These tasks are performed IAW TOs *1C-141B-2-29JG-10-1-1, Hydraulic Systems, 1C-141B-2-32-JG-00-1, Landing Gear General Maintenance, and 1C-141B-2-32-JG-40-1, Main Landing Gear Brakes & Anti-Skid.*
- During routine brake inspections, the brakes are removed, reconditioned, replaced, and then the system undergoes an operational check. Reconditioning the brakes takes place in the Brake shop or in the Non-Destructive Inspection (NDI) shop. The brake inspections are performed under TOs *1C-141B-2-32-JG-40-1, Main Landing Gear Brakes & Anti-Skid.*
- Replace main landing gear (MLG) and various components (e.g., struts). These tasks are performed IAW TOs *1C-141B-2-29JG-10-1-1, Hydraulic Systems, 1C-141B-2-32-JG-00-1 and Landing Gear General Maintenance.*

Only authorized materials, or materials that have been fully evaluated and approved by SEG, CEF, and BE offices can be used within the wheel well area.

# C-141 STARLIFTER

## WHEEL WELL AREA – NOSE (FORWARD)



### SPACE DESCRIPTION

The nose wheel well area is located near the nose of the aircraft. The space contains the landing gear, the wheel and tire assembly, the hydraulic brake system, electrical lines, hydraulic/nitrogen struts, and gear assembly.



Figure 13. Nose Wheel Well: Exterior left side.

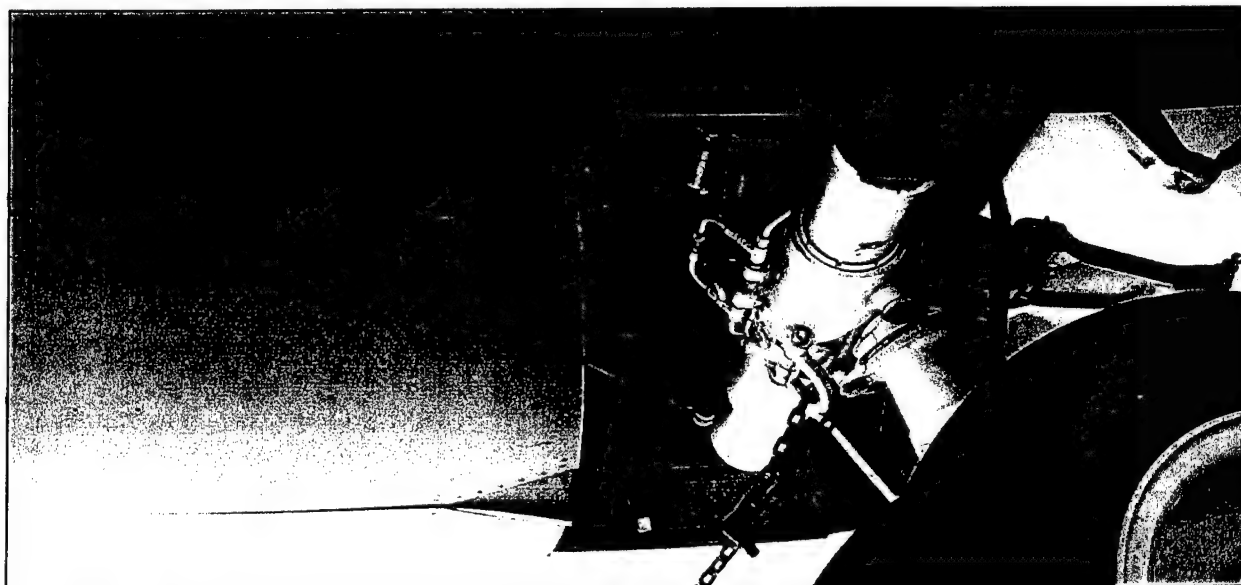


Figure 14. Nose Wheel Well: Bottom left interior view.

## **INNER DIMENSIONS**

Length (forward to aft) = 18.0'  
Width (left to right) = 9.0'  
Depth (top to bottom) = 4.0'

## **ENTRY DIMENSIONS**

1. Length = 4.5'      Width = 4.0'  
2. Length = 4.5'      Width = 2.0'  
3. Length = 4.5'      Width = 2.0'  
(all entrances are rectangular)

[The depth is the distance from the entrance to the most distant point.]

## **SPACE ACCESS/INNER AREA**

The nose wheel well has two identical bottom access panels located at the forward end of the space. A larger bottom access panel is located the aft end.

## **RECOMMENDED CLASSIFICATION**

Not a confined space.

## **JUSTIFICATION FOR CLASSIFICATION**

The wheel well area does not have a limited means of entry and egress due to the size of the bottom entrances. Therefore, it is not a confined space and not regulated IAW the AFOSH and OSHA confined space standards.

## **TASKS PERFORMED WITHIN THE SPACE**

Personnel from several work centers can enter the nose wheel well to perform both general and emergency maintenance activities. These work centers may include Aircraft Structural Repair, Non-Destructive Inspection Maintenance, ISO Dock, etc. The majority of activities conducted within this space are for inspections and routine scheduled maintenance only, and no chemicals are used. Flightline, depot, and other related activities are not referenced in this document. However, some tasks performed during aircraft structural repair and ISO Dock maintenance, may require the use of various solvents, cleaners, adhesives, paints, and primers. The following tasks may be performed during scheduled and routine maintenance:

- Scheduled maintenance inspections are conducted on each wheel and tire assembly as needed or depending on the number of landings. The bearings are greased/lubed, and nitrogen is added to the tires. Both tasks take a few minutes. These tasks are performed IAW the following TOs:

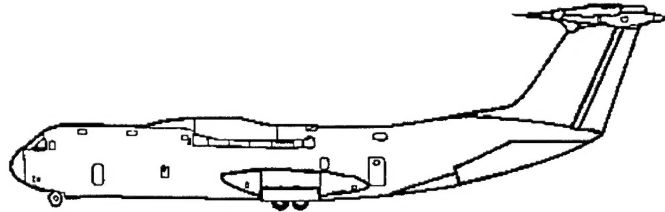
*1C-141B-2-29JG-10-1-1, Hydraulic Systems,  
1C-141B-2-32-JG-00-1, Landing Gear General Maintenance, and  
1C-141B-2-32-JG-40-1, Main Landing Gear Brakes & Anti-Skid.*

- During routine brake inspection, the brakes are removed, reconditioned, replaced, and then the system undergoes an operational check. Reconditioning the brakes takes place in the Brake shop. The brake inspections are performed under TO *1C-141B-2-32-JG-40-1, Main Landing Gear Brakes & Anti-Skid.*
- Replace main landing gear (MLG) and various components (e.g., struts). These tasks are performed IAW TOs *1C-141B-2-29JG-10-1-1, Hydraulic Systems, 1C-141B-2-32-JG-00-1, and Landing Gear General Maintenance.*

Only authorized materials, or materials that have been fully evaluated and approved by SEG, CEF, and BE offices can be used within the wheel well area.

# C-141 STARLIFTER

## WHEEL WELL PODS – (LEFT/RIGHT)



### SPACE DESCRIPTION

There is a single wheel well pod above each aft wheel well area (two wheel well pods total). The spaces contain fuel lines (only in right wheel well pod) and hydraulic lines. Usually the wheel well pods are used for storing items such as wheel chocks and engine covers.

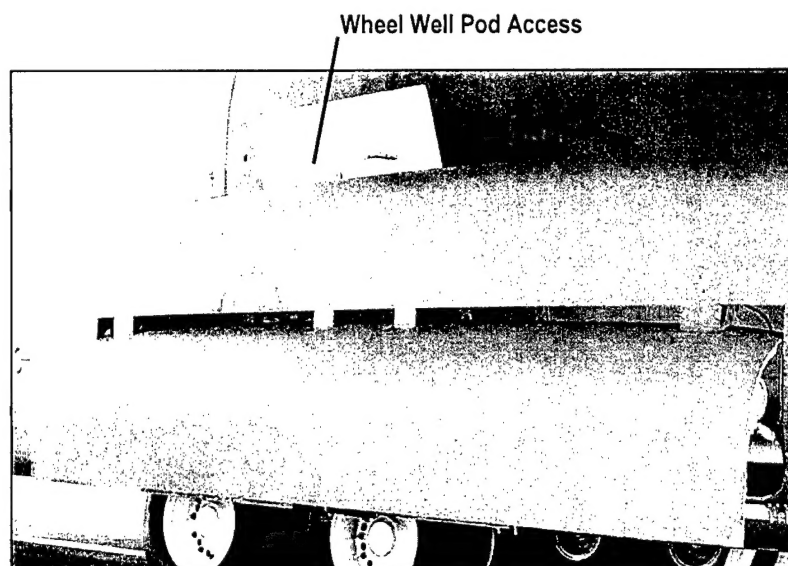


Figure 15. Wheel Well Pod: Exterior right side. Access on top.



Figure 16. Wheel Well Pod: Interior right side.

### INNER DIMENSIONS

Length (forward to aft) = 6.5'  
Width (left to right) = 2.0' to 5.5'  
Depth (top to bottom) = 3.0 to 4.5'

### ENTRY DIMENSIONS

1. Length = 3.0'      Width = 1.5' to 2.0'  
2. Length = 3.5'      Width = 2.0'  
(both entrances are rectangular)

[The depth is the distance from the entrance to the most distant point.]

### SPACE ACCESS/INNER AREA

Each wheel well pod has two rectangular entrances on the top of the space.

## RECOMMENDED CLASSIFICATION

Not a confined space.

## JUSTIFICATION FOR CLASSIFICATION

The wheel well pods do not have a limited means of entry and egress due to the size of the top entrances. Therefore, they are not confined spaces and not regulated IAW the AFOSH and OSHA confined space standards.

## TASKS PERFORMED WITHIN THE SPACE

Personnel from several work centers can enter the nose wheel well to perform both general and emergency maintenance activities. These work centers may include Aircraft Structural Repair, Non-Destructive Inspection Maintenance, ISO Dock, etc. The majority of activities conducted within this space are for inspections and routine scheduled maintenance only, and no chemicals are used. Flightline, depot, and other related activities are not referenced in this document. However, some tasks performed during aircraft structural repair and ISO Dock maintenance, may require the use of various solvents, cleaners, adhesives, paints, and primers. The following tasks may be performed during scheduled and routine maintenance:

- *1C-141B-2-29JG-10-1-1, Hydraulic Systems.*
- *1C-141B-2-29JG-10-1-1, Hydraulic Systems Operational Check.*
- *1C-141B-2-28JG-00-1, Fuel Systems General.*

Only authorized materials, or materials that have been fully evaluated and approved by SEG, CEF, and BE offices can be used within the wheel well pods.



# C-141 STARLIFTER

## AVIONICS BAY

Not Shown  
(Located Inside Aircraft)

### SPACE DESCRIPTION

The avionics bay is located in the forward cargo area, behind the flight-deck. The space contains avionics computers/components, variety of electrical and hydraulic lines, circuit breakers, etc.

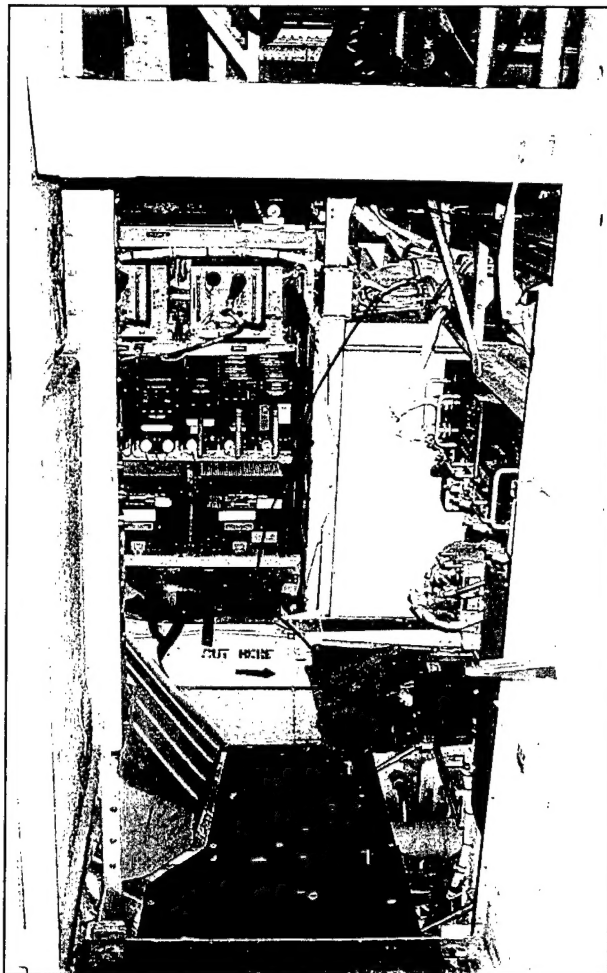


Figure 17. Avionics Bay: Left side.

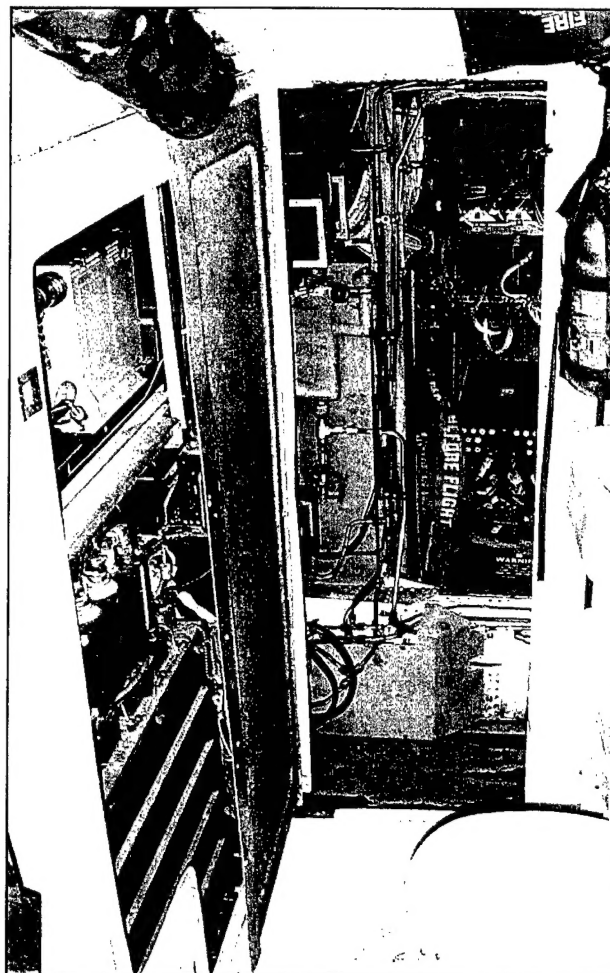


Figure 18. Avionics Bay: Right side.

### INNER DIMENSIONS

Cannot be determined.

### ENTRY DIMENSIONS

1. Left: Length = 4.0' Width = 2.0'
  2. Right: Length = 4.5' Width = 1.5'
- (both entrances are rectangular)

## **SPACE ACCESS/INNER AREA**

The avionics bay has two side entrances located behind the flight-deck area. The inner dimensions cannot be determined due to the substantial clutter of various components in and around the space.

## **RECOMMENDED CLASSIFICATION**

Not a confined space.

## **JUSTIFICATION FOR CLASSIFICATION**

The avionics bay does not have a limited means of entry and egress. Therefore, it is not a confined space and not regulated IAW the AFOSH and OSHA confined space standards.

## **TASKS PERFORMED WITHIN THE SPACE**

Personnel from several work centers can enter the avionics bay to perform both general and emergency maintenance activities. These work centers may include Aircraft Structural Repair, Non-Destructive Inspection Maintenance, ISO Dock, etc. The majority of activities conducted within this space are for inspections and routine scheduled maintenance only, and no chemicals are used. However, some of the activities performed during aircraft structural repair and ISO Dock maintenance, may require the use of various solvents, cleaners, adhesives, paints and primers. The following task is conducted within the avionics bay during scheduled and routine maintenance:

- Avionics computers and components are inspected, troubleshooted, and replaced as needed.

Only authorized materials, or materials that have been fully evaluated and approved by SEG, CEF, and BE offices can be used within the wheel well area.